A Section 508–conformant HTML version of this article is available at https://doi.org/10.1289/EHP13761.

Beyond Wind and Flood: Review of Cyclone Research Spotlights Trauma Outcomes

Charles Schmidt

https://doi.org/10.1289/EHP13761

Tropical cyclones are increasing in severity.[1,2] With sustained winds of at least 74 miles per hour, these storms—also called hurricanes or typhoons depending on where they occur[3]—can be enormously destructive and are associated with a range of both direct[4,5] and indirect[6,7] health consequences. But high-quality data on their human health effects are lacking, especially in countries with less-developed research capacity, according to the authors of a new paper in *Environmental Health Perspectives*.[8]

To assess known health risks from cyclones, the Australian team performed a systematic review and meta-analysis of the peer-reviewed literature. Their findings[8] provide much-needed insights into both disease risks associated with cyclone exposures and gaps in our knowledge. The most consistent evidence among the papers reviewed linked cyclone exposure to mental health problems, especially post-traumatic stress disorder (PTSD). One study reported that elevated PTSD risks were observed 2 to 3 years after the event.[9] Higher risk was reported in the population overall and was evident in specific subgroups, including pregnant women, high school students, and public health workers.

Cyclones are expected to become more intense with climate change,[2] and ideally, this study will help policymakers and public health authorities develop targeted interventions to mitigate health impacts of cyclones on affected populations, says Shanshan Li, an associate professor in the School of Public Health and Preventive Medicine at Melbourne's Monash University and one of the study's two corresponding authors.

The initial literature search yielded more than 19,000 studies, yet only 71 of them—most focused on cyclones that struck the United States—met prespecified criteria. For example, studies must have provided population-based risk estimates for adverse health outcomes among people exposed to cyclones of varying intensities. Papers that discussed only health effects of events that occurred after the cyclone (e.g., flooding) and those that did not assess human health outcomes were excluded. The authors also conducted a risk-of-bias assessment to ensure the papers they reviewed had been rigorously conducted and reported.

Robbie Parks, an assistant professor of environmental health sciences at Columbia University in New York, who was not involved

Besides their findings regarding health outcomes, the authors of the new review reported a paucity of studies outside the United States, especially in countries where they suggested adverse effects could be more pronounced, such as in the Philippines, shown here, and elsewhere in Southeast Asia. Image © iStock.com/Matias Olivieri.

in the study, underscored the usefulness of the review's synthesis of health impacts data. "Hurricanes exhibit natural variation depending on where they strike, wind speed, and other variables, so it can be difficult to study health impacts if focused on one location or country," he says.

During their investigation, the team focused on the following cyclone-associated outcomes: all-cause mortality and hospitalizations, injuries, adverse birth outcomes, mental health outcomes, diabetes, and cancer, as well as cardiovascular, respiratory, and infectious diseases. In addition to the associations between storm exposures and PTSD, the team found that living through a cyclone was associated with increased risks for all-cause mortality, all-cause hospitalizations, and hospitalizations for respiratory diseases overall, as well as chronic obstructive pulmonary disease in particular.

Associations with other outcomes were mixed or limited by comparison, likely because fewer studies focused on these outcomes, according to the authors. The paper's second corresponding author, Yuming Guo, a professor of global environmental health and statistics at Monash University, noted that hypothetically the risks of other outcomes—anxiety or depression, for example—could be as high as for PTSD, but because those outcomes were less studied, there are not yet enough data to draw that conclusion.

The scarcity of epidemiological evidence from low- and middle-income countries is a source of considerable heterogeneity in the overall results, according to the authors. Li says populations in Vietnam, India, Bangladesh, and the Caribbean, for instance, are likely to be more vulnerable to cyclones due to characteristics such as densely populated coastal areas and lack of sanitation and drinking water infrastructure. "Yet very little is known about the spatiotemporal disease risks and burdens in these countries," she says. The considerable heterogeneity among the studies in terms of exposure assessments and modeling strategies hinders the synthesis and generalizability of the findings, she explains.

Victoria Lynch, an environmental epidemiologist and postdoctoral investigator at the Columbia University Mailman School of Public Health in New York, who was not involved in the research, agrees. The paper highlights the need for more studies, "especially in the countries that are most susceptible to these storms," she says. Another important point raised in the paper, Lynch adds, is that the wide range of methods and measures used in the field make it difficult to look across studies to see how consistent a finding might be. "If there were a more rigorous debate around the most effective approaches to methodologically study health impacts from cyclones," she says, "that could allow for more consistent studies and then the ability to meta-analyze them."

Charles Schmidt is an award-winning freelance writer in Portland, ME.

References

1. Wang S, Toumi R. 2021. Recent migration of tropical cyclones toward coasts. Science 371(6528):514–517, PMID: 33510027, https://doi.org/10.1126/science.abb9038.
2. Colbert A. 2022. A force of nature: hurricanes in a changing climate. 1 June 2022. https://climate.nasa.gov/news/3184/a-force-of-nature-hurricanes-in-a-changing-climate/ [accessed 26 September 2023].
3. NOAA (National Oceanic and Atmospheric Administration). 2023. What is the difference between a hurricane and a typhoon? Last updated 20 January 2023. https://oceanservice.noaa.gov/facts/cyclone.html [accessed 26 September 2023].
4. Parks RM, Benavides J, Anderson GB, Nethery RC, Navas-Acien A, Dominici F, et al. 2022. Association of tropical cyclones with county-level mortality in the US. JAMA 327(10):946–955, PMID: 35258534, https://doi.org/10.1001/jama.2022.1682.
5. Cruz-Cano R, Mead EL. 2019. Causes of excess deaths in Puerto Rico after Hurricane Maria: a time-series estimation. Am J Public Health 109(7):1050–1052, PMID: 30998411, https://doi.org/10.2105/AJPH.2019.305015.
6. Yan M, Wilson A, Dominici F, Wang Y, Al-Hamdan M, Crosson W, et al. 2021. Tropical cyclone exposures and risks of emergency Medicare hospital admission for cardiorespiratory diseases in 175 urban United States counties, 1999–2010. Epidemiology 32(3):315–326, PMID: 33591048, https://doi.org/10.1097/EDE.0000000000001337.
7. Waddell SL, Jayaweera DT, Mirsaeidi M, Beier JC, Kumar N. 2021. Perspectives on health effects of hurricanes: a review and challenges. Int J Environ Res Public Health 18(5):2756, PMID: 33803162, https://doi.org/10.3390/ijerph18052756.
8. Huang W, Gao Y, Xu R, Yang Z, Yu P, Ye T, et al. 2023. Health effects of cyclones: a systematic review and meta-analysis of epidemiological studies. Environ Health Perspect 131(8):086001, PMID: 37639476, https://doi.org/10.1289/EHP12158.
9. Schwartz RM, Gillezeau CN, Liu B, Lieberman-Cribbin W, Taioli E. 2017. Longitudinal impact of Hurricane Sandy exposure on mental health symptoms. Int J Environ Res Public Health 14(9):957, PMID: 28837111, https://doi.org/10.3390/ijerph14090957.